

# REPORT DOCUMENTATION PAGE

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36 separate files are enclosed

128  
111

C2

TP-FY99-0133

✓ Spreadsheet  
✓ DTS

MEMORANDUM FOR PRS (~~Contractor~~/In-House Publication)

FROM: PROI (TI) (STINFO)

16 June 1999

SUBJECT: Authorization for Release of Technical Information, Control Number: AFRL-PR-ED-TP-FY99-0133  
C.T. Liu, "Microstructure Induced Inhomogeneous Strain in a Particulate Composite"

1999 ASME Summer Conference

(Public Release)

# **Microstructure Induced Inhomogeneous Strain in a Particulate Composite**

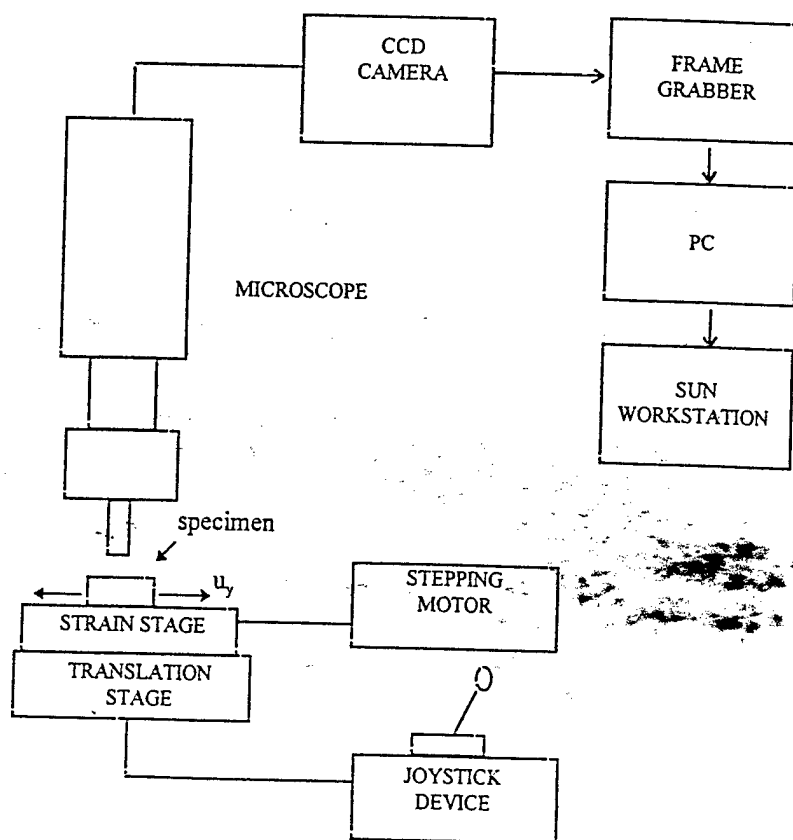
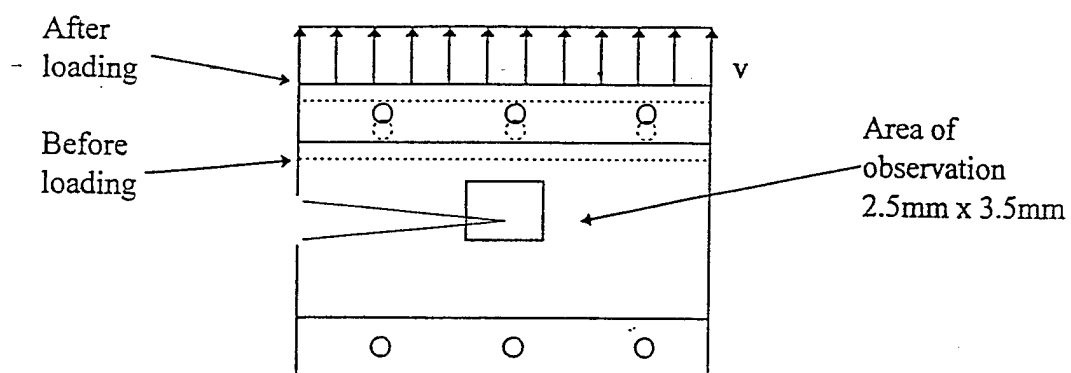
C. T. Liu  
And  
J. Gonzales

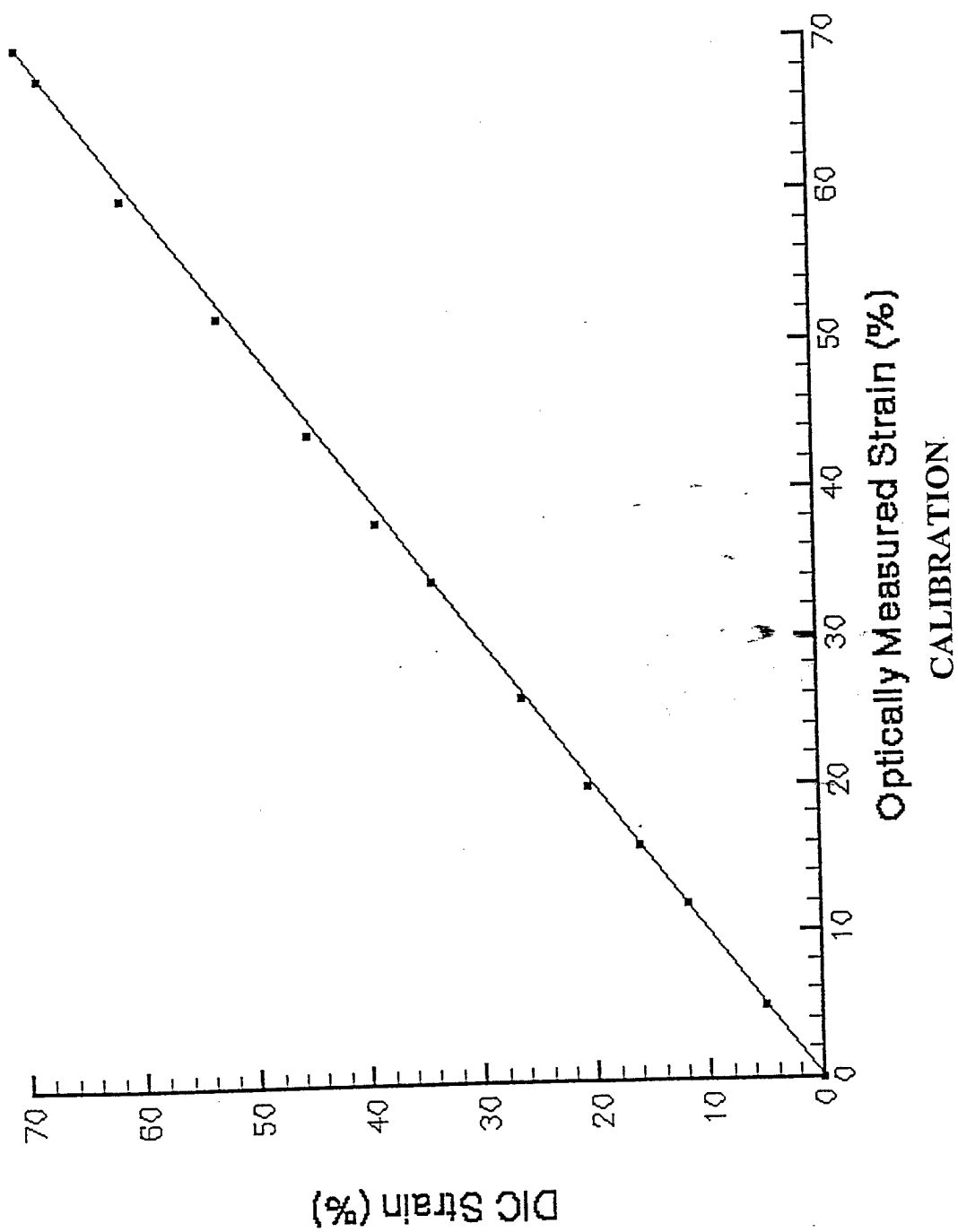
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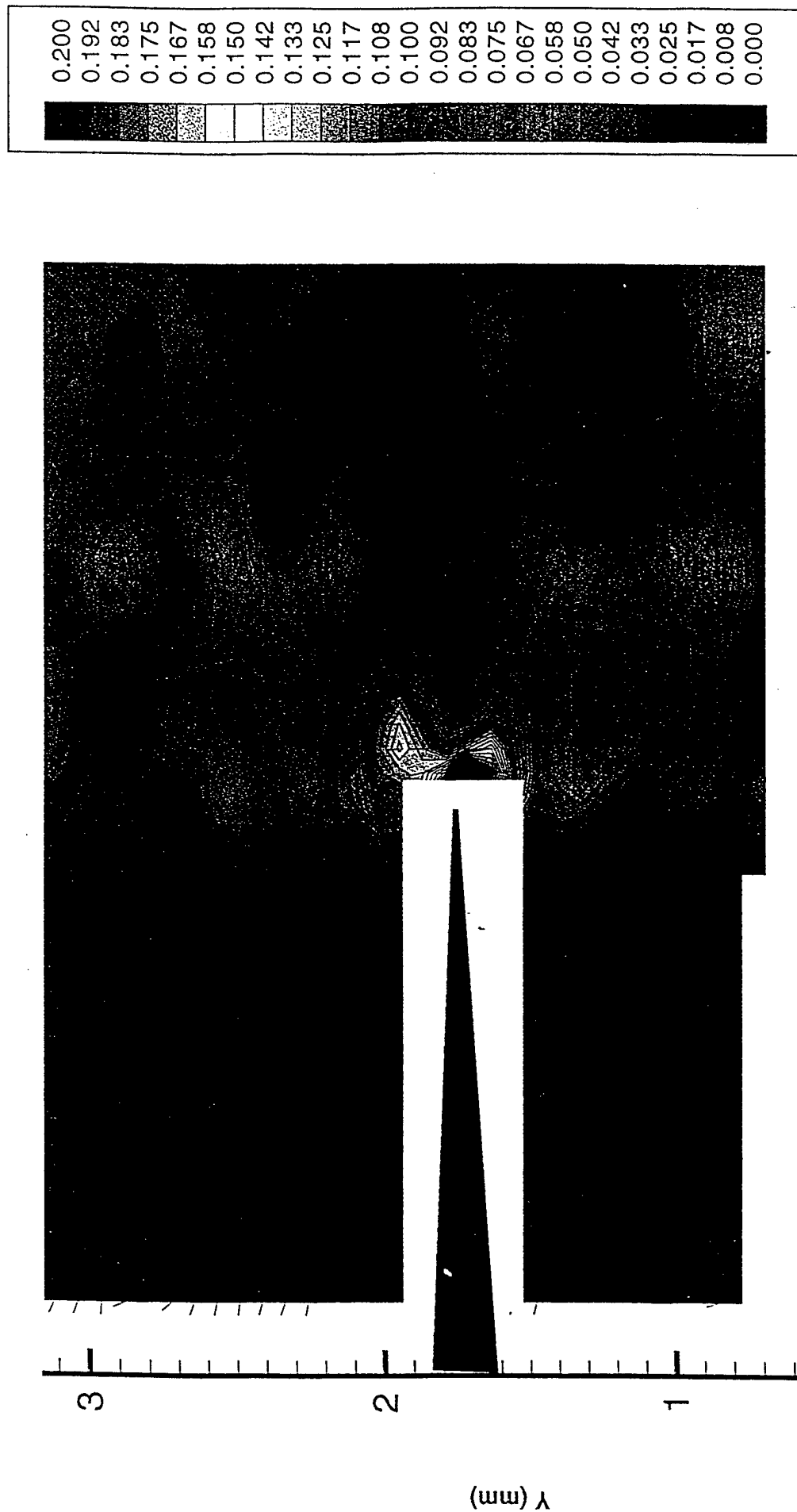
## **Objectives**

- **Investigate the Effect of Microstructure on the Strain Distribution near the Crack Tip.**
- **Determine the Local Strain Concentration Factor and Strain Rate near the Crack Tip.**

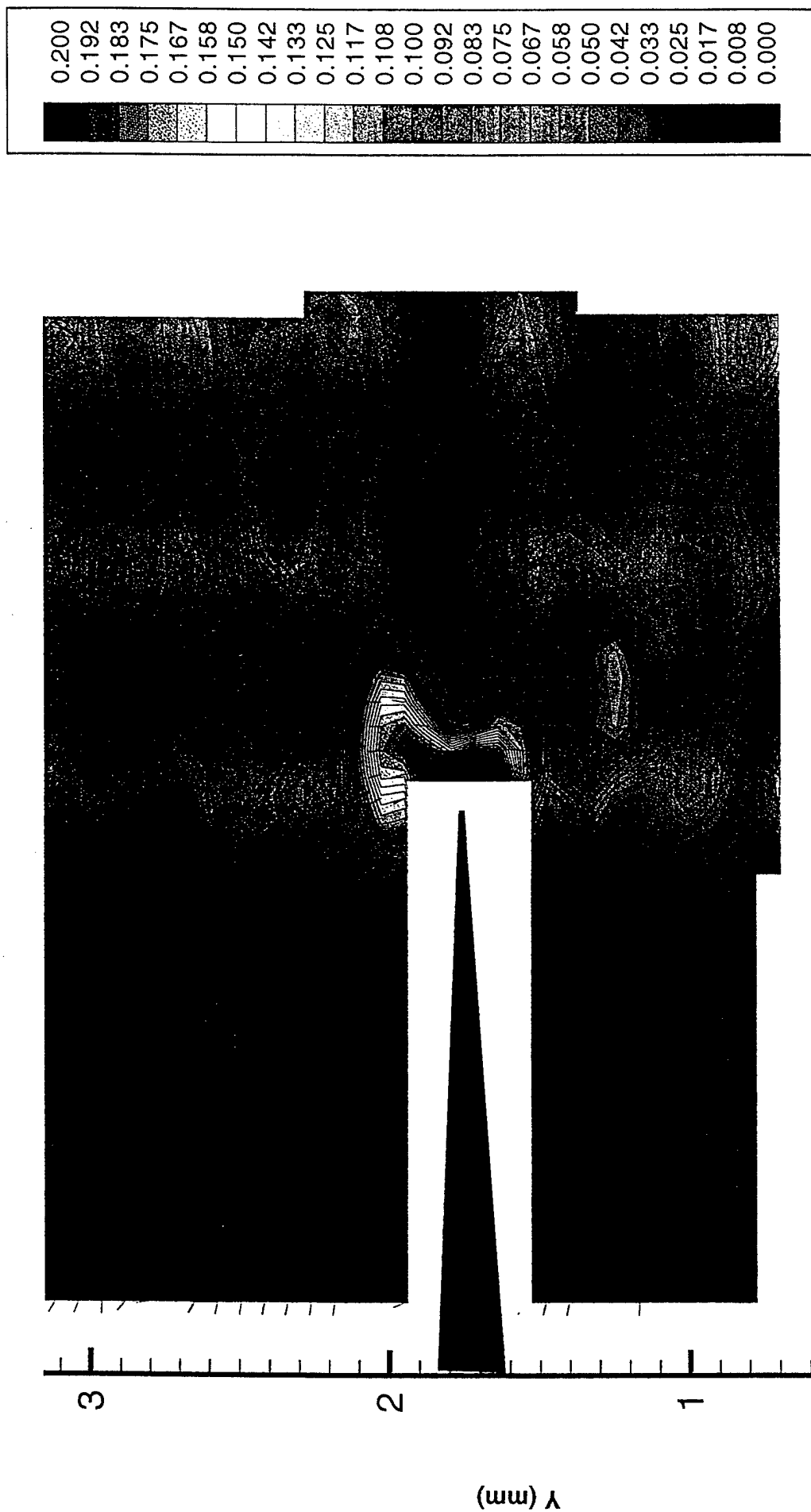




Maximum Principal Strain Distribution for  
2.8% Far Field Strain  
Test 1



Maximum Principal Strain Distribution for  
4.2% Far Field Strain  
Test 1

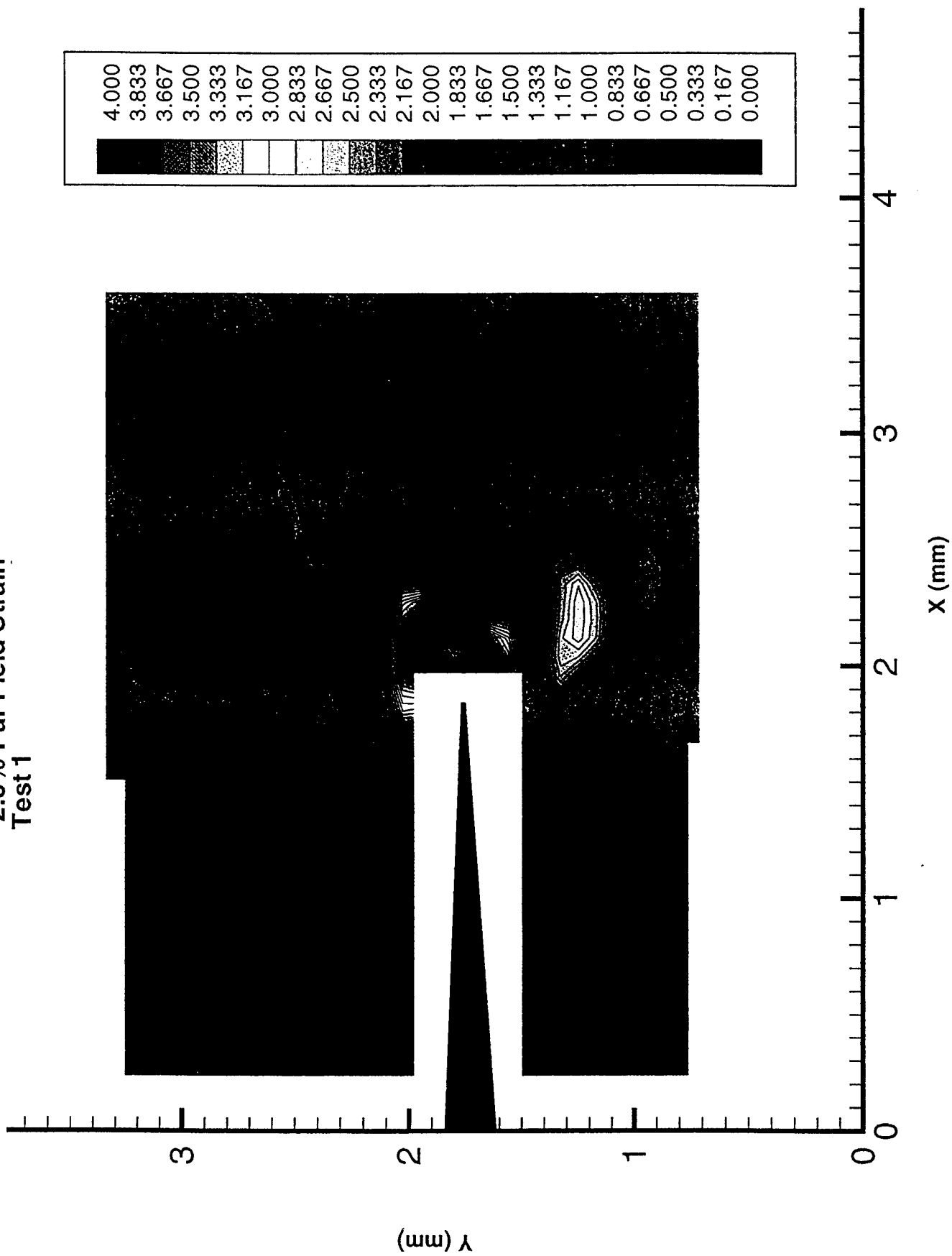




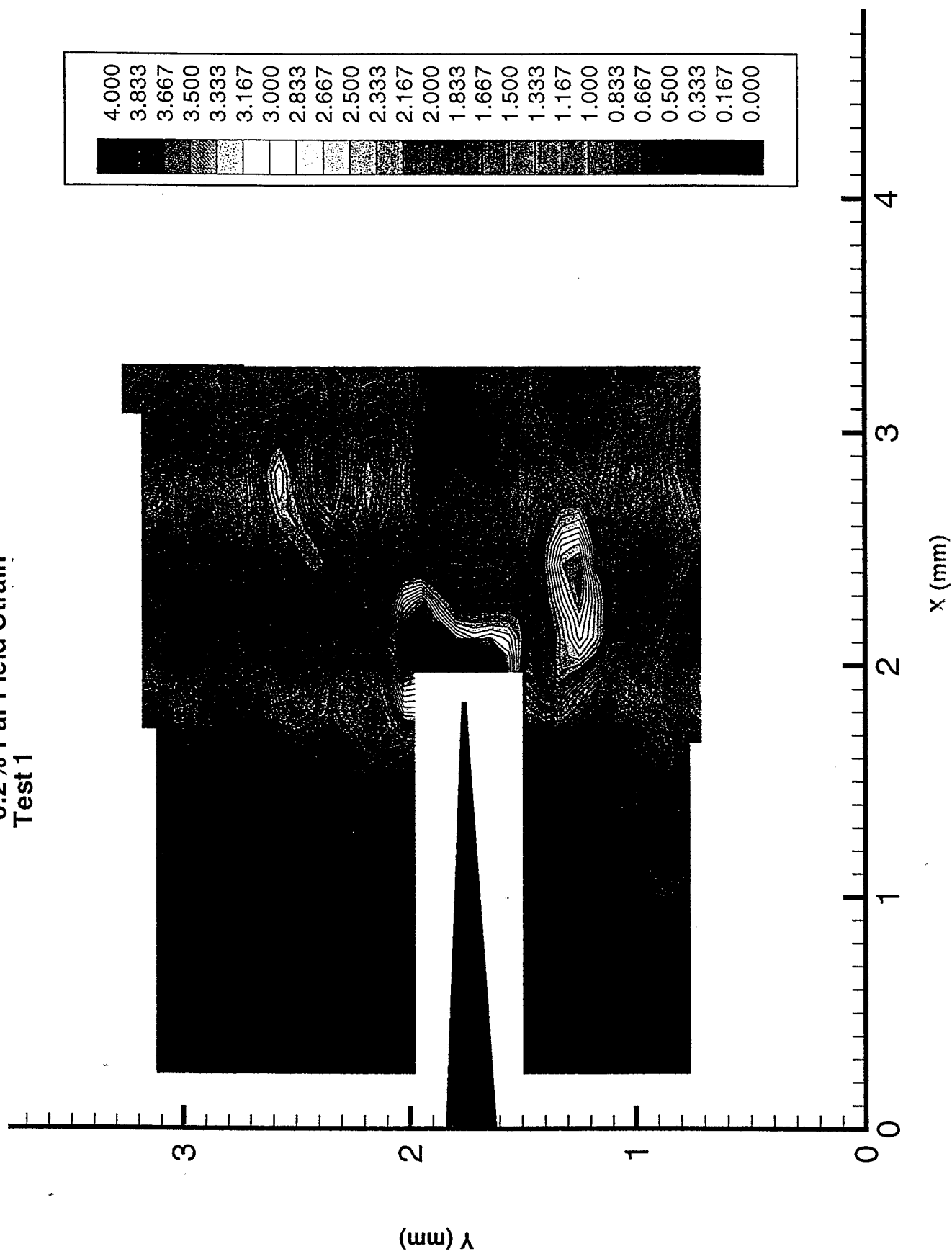
Maximum Principal Strain Distribution for  
8.2% Far Field Strain  
Test 1



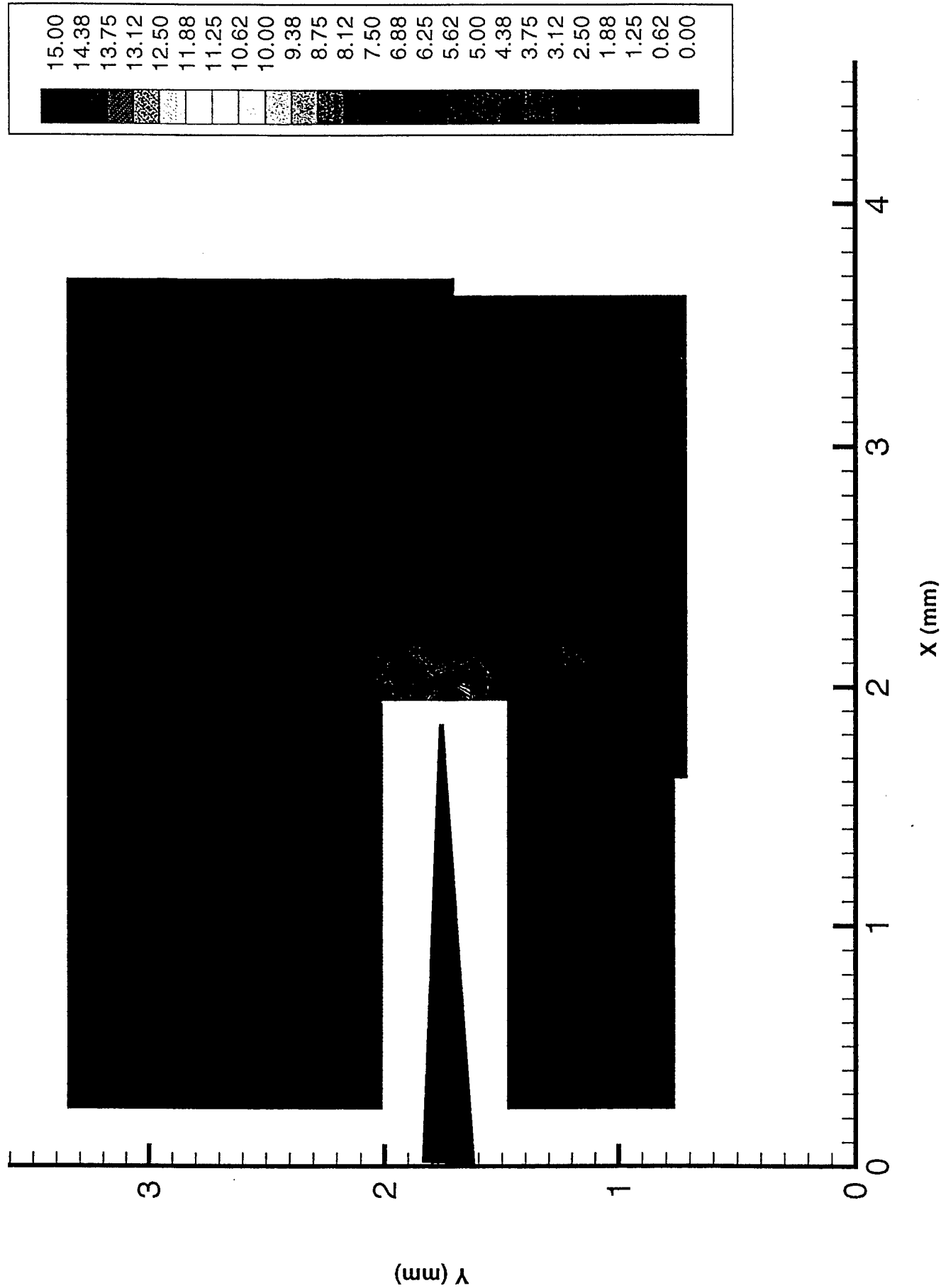
Strain Concentration Distribution for Step 4  
2.8% Far Field Strain  
Test 1



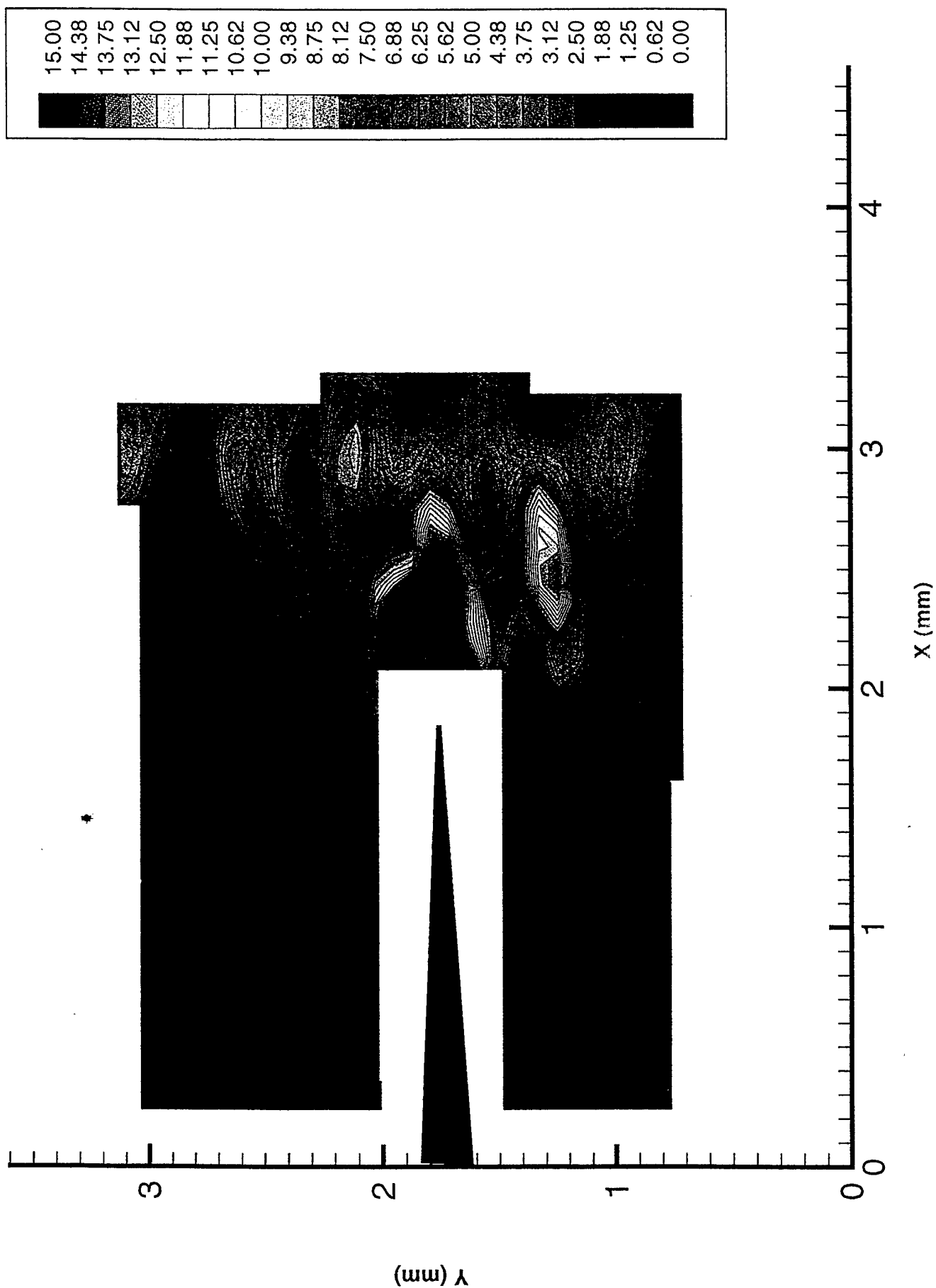
# Strain Concentration Distribution for Step 12 8.2% Far Field Strain Test 1



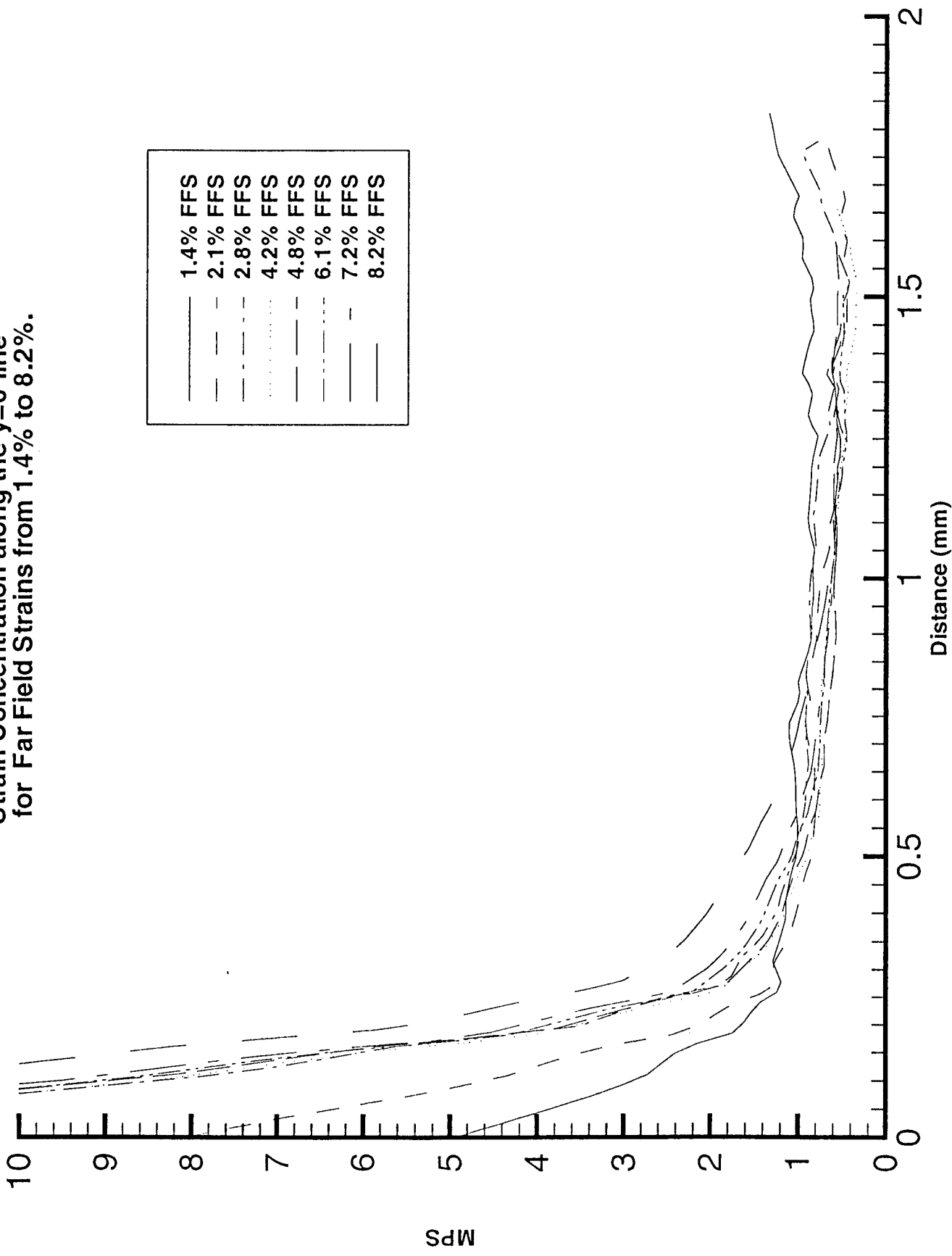
Non Dimensional Local Strain Rate in the y - Direction  
At 0.001 (1/s) Far Field Strain Rate and 2.5% Far Field  
Strain. Test 1



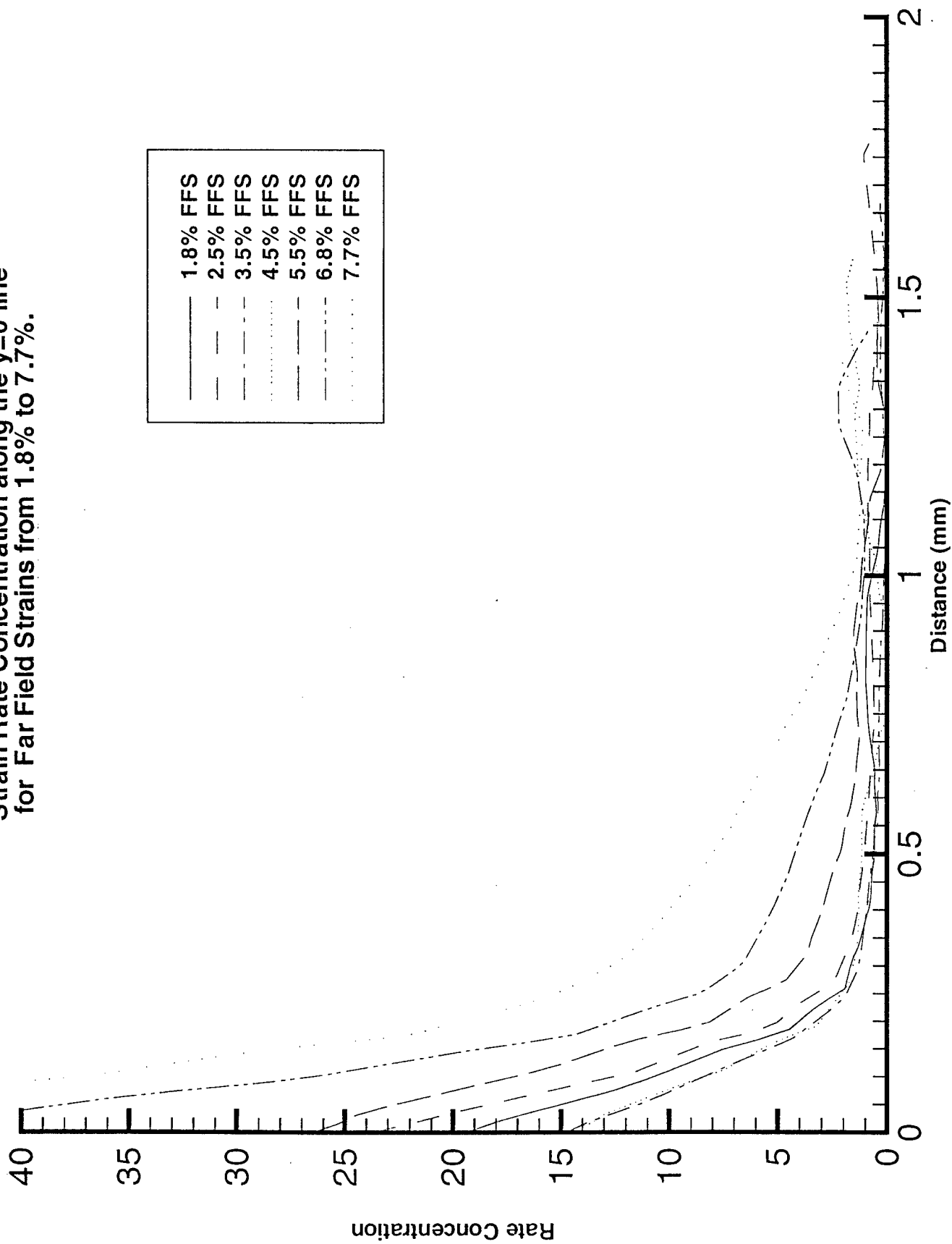
Non Dimensional Local Strain Rate in the y - Direction  
 At 0.001 (1/s) Far Field Strain Rate and 8.5% Far Field  
 Strain. Test 1



Strain Concentration along the  $y=0$  line  
for Far Field Strains from 1.4% to 8.2%.



Strain Rate Concentration along the  $y=0$  line  
for Far Field Strains from 1.8% to 7.7%.



## **Conclusions**

- 1. The Digital Image Correlation Technique can be used to Determine Strain Fields where Inhomogeneous Deformations are presented.**
- 2. The High Strain Field is Localized within 1 mm of the Crack Tip.**
- 3. The Microstructure of the Material has a Significant Effect on the Strain Fields near the crack tip.**
- 4. The Crack Growth Mechanism Consists of Void Generation and Coalescence with the Main Crack Tip.**